

Criteria for Newspaper Article

Your major task in this activity is to collect the understandings and information you need to write a useful article for your school newspaper on influenza and evolution. A complete article will answer the following questions:

- What is influenza or the “flu”?
- How do scientists use data to explore how influenza genes evolve?
- What evidence do scientists use to conclude that some influenza genes evolve relatively rapidly?
- How can variation develop among influenza viruses?
- How does natural selection help explain the evolution of influenza?
- How does evolution help explain why a new vaccine for influenza is needed every few years?

Use the following table to help organize your description of natural selection in influenza.

Feature of an explanation of natural selection	Describe how the feature works in your example
In what ways does the population vary for an important trait?	
Can some of the differences in traits among individuals be passed from parents to offspring? Explain.	
How did the variation arise?	
Do individuals with certain traits survive and reproduce at relatively higher rates? Explain.	
How will the frequency of traits and the alleles affecting those traits change in the population over time?	

You may want to create a new page for each question in the bulleted list in your notebook. This will help you keep track of your understandings as you proceed through the lesson.

Introduction to Influenza

Influenza basics

Influenza, also called the “flu,” is an illness that is caused by a virus. The influenza virus infects lung cells and causes respiratory illness. The illness caused by the influenza virus can be mild, severe, or even cause death. Influenza has a large impact on human health. For example, on average each year

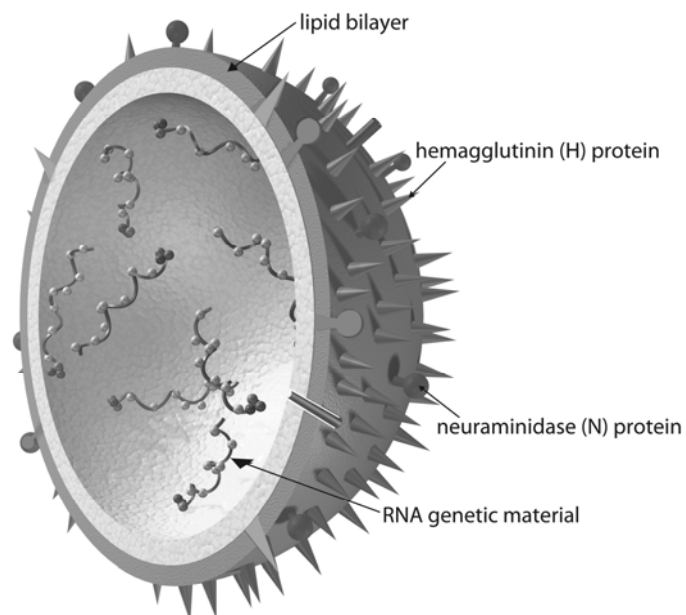
- 5% to 20% of Americans suffer from the flu,
- Complications from the flu result in hospital stays for over 200,000 Americans, and
- Flu-related effects cause the death of about 36,000 Americans, and about 500,000 people across the world.

Symptoms of a flu infection include a high fever, extreme tiredness, muscle aches, a dry cough, sore throat, and a stuffed nose. In otherwise healthy people, symptoms from the flu are usually gone after 4 to 7 days, but they can last longer.

Occasionally, new strains of influenza emerge that cause global pandemics. A pandemic is a large-scale infectious disease outbreak that spreads throughout the world. In the “Spanish flu” pandemic of 1918-19, hundreds of millions of people were infected and about 50 million people died.

Structure of the virus

The influenza virus is made up of genetic material that is surrounded by a membrane. The membrane has two main proteins inserted in the membrane like spikes (see the figure below). The names of these proteins are hemagglutinin (H) and the neuraminidase (N). Influenza has eight segments of RNA that contain 11 genes. Importantly, the genetic material is RNA, not DNA. RNA is more prone to mutations than is DNA.



Influenza virus.

Image credit: NIH's National Institute of Allergy and Infectious Disease.

Types of influenza viruses

Three main types of influenza viruses exist, named A, B, and C. The type is based on the forms of specific proteins found in influenza. Types A and B are responsible for the seasonal flu that sweeps across the globe every year. Type A is responsible for some of the outbreaks of the flu that have caused a larger number of deaths than normal. Type C only causes a mild illness and does not cause epidemics.

Each type of the virus can be further broken down into more specific groups.

Categorizing influenza viruses

- Type A
 - Subtype is based on hemagglutinin (abbreviated H; 16 forms, named H1-H16) and neuraminidase (N; 9 forms, named N1-N9). The form of H and N determine the subtype, for example H3N2.
 - Different strains exist for each subtype
- Type B
 - No subtypes, but different strains exist
- Type C
 - No subtypes, but different strains exist

Strains from influenza A H1N1, H3N2, and influenza B are included in each year's seasonal influenza vaccine. The specific strains in the vaccine have to be changed over time, however.

Though many humans are infected each year, influenza is considered a “bird-disease.” A much greater diversity of different types of influenza are found in birds compared to other animals.

How do you get the flu?

The typical way to get the flu is to inhale a virus from another infected person. Infected people release viruses when they cough and sneeze. You can also get the flu by touching your mouth or nose after touching something with flu viruses on it. You can usually start infecting other people 1 day before you show symptoms and continue to infect people 5-7 days after getting sick. As you can imagine, this makes it very difficult to control the flu.